QUARTERLY STATUS REPORT No. 3

Period 23 March 1965 - 22 June 1965

DESIGN, DEVELOPMENT, FABRICATION AND INSTALLATION OF 105-INCH LUNAR AND PLANETARY TELESCOPE AT McDONALD OBSERVATORY

Contract NASr-242

Project Director: Harlan J. Smith
Director, McDonald Observatory

Department of Astronomy

Austin, Texas

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A. Review of Progress Prior to this Reporting Period

The first two quarterly status reports primarily dealt respectively with initiation of the telescope project (notably selection of optical parts fabricator, and of the telescope designer), and with the initial stages of the design work including selection of basic design parameters.

B. Progress during the Period 23 March - 22 June 1965

There has been less outwardly-visible activity during the current quarterly reporting period than will probably be true of any of the other thirteen projected contract quarters. This occurred because the current period was almost entirely involved with working out details and consequences of design decisions provisionally arrived at for reasons discussed in earlier reports. But particular events or noteworthy decisions included:

1. IAU Symposium on Large Telescopes

In early April, the International Astronomical Union held a symposium with limited invited attendance, on the subject of Large Telescopes. Despite the fact that, at only 2.7 meters aperture, our telescope falls short of the 3-meter minimum size defined by the organizers as "large", H. J. Smith and C. W. Jones were able to attend the eight-day meetings in Tucson, Pasadena, and Mount Hamilton. We were not surprised to find most of our design judgements in step with the consensus of other experienced telescope designers and users. The two main areas of divergence arise from our retaining the cross-axis configuration and the relatively long primary F/ratio of 4; really large telescopes are driven to varieties of symmetrical declination support, and (largely for the sake of tube length and dome size) to F/ratios as short as 2.5 to 3. In these senses the planned 105-inch represents a peak in size of the older tradition of telescopes, with attendant advantages of somewhat lower-cost and simpler mounting especially for coude work, plus more rapid completion of what should be superior optics coupled with availability of wider well-corrected fields. The principal new aspect of design affecting our telescope was the progress reported in wide-field prime and Cassegrain focus correcting lenses, to accompany a Ritchey-Chretien primary.

2. Addition of Prime-Focus Cage

The potential availability of a well-corrected prime-focus field of at least 1-1/2 degrees has led to the decision to incorporate a prime-focus cage as a principal observing position (Print No. 2 appended). This adds about nine feet to the effective length of the telescope tube when the prime-focus cage is mounted, and has necessitated some improvement in the tube structure, conterweighting, and supports. It also raises interesting problems of access.

3. Mechanical Design

Design of the telescope continued steadily throughout this reporting period. Approximately every two weeks H. J. Smith spent one or two days in Los Angeles discussing with Mr. Jones and with Mr. J. O'Rourke (principal C. W. Jones Co. engineer responsible for this telescope) the current problems and the decisions required to permit further progress. Results of these discussions appear in the appended plans, wherein the telescope design is beginning to come into rather sharp focus. In particular, much time was spent studying the critical declination bearing, and estimating its friction and potentially grave amount of stiction. To reduce polar axis drive friction, oil pad bearings will now be used (Print No. 2 appended).

4. Dome and Building

Detailed dome design and layout have been considered seriously for the first time. In order to fit all of the desired functions into the dome and building, including the prime focus position, it will be strongly desirable to put the telescope in a more spacious dome than the 65-footer originally planned. Accordingly, provisional plans for a 78-foot dome and building have been worked out, and are appended.

5. Optical Design

In order to be able to get the best performance using simple two-mirror Cassegrain-coude systems, the general optical design should be a variation on the classical Ritchey-Chretien. In turn, as noted in paragraph 1 above, when used with correcting lenses at the Cassegrain and the prime focus, these mirror figures can be optimized to give much larger and flatter fields than are possible with the single or double reflections alone. Design of these elements, and of the optics for the coude spectrograph, are problems currently challenging the best optical designers. During this quarterly reporting period, an initial search was undertaken for a qualified optical designer interested in working with our special problems. The two best and most experienced in the United States for this, J. G. Baker and D. Schulte, were fully occupied but recommended C. G. Wynne of Imperial College, London. Wynne expressed some interest in considering the work.

6. Optical Fabricators

Several firms in the United States are competent to do, or at least are interested in, the figuring of the large optics of our telescope. During this reporting period, the Project Director made first contact with and visited the principal West Coast firms: Davidson Optronics (an excellent record, including a first-class job on the only large quartz mirror so far produced, the Naval 61-inch, but a relatively small shop which would have to be expanded for our job); Perkin-Elmer, Western Division (a number of competent opticians, but experience so far entirely in smaller work, although able to draw on the very large facilities and experience of the Eastern Division of Perkin-Elmer); Tinsley (possessing machines large enough for the work, but with very little experience so far in optics of fully professional astronomical quality). Several East Coast firms, although not visited during this reporting period, have also expressed interest in the work. One European firm, Grubb-Parsons of Newcastle on Tyne (the principal European builder of large telescopes), has recently completed a 200-inch grinding machine of very high quality complete with large vertical test tunnel. It is possible that Grubb-Parsons might be able to produce the best and fastest job, for the lowest price. In early April, Grubb-Parsons' chief designer, G. Sisson, at his own initiative paid a two-day visit to Austin to discuss with us some of the problems of the 105-inch telescope, and at that time made clear the opportunity available through this as yet unique facility.

7. Telescope Contractors

Three major firms in the United States have both experience with large telescopes and a reputation for fast, responsible and successful performance. During the present reporting period, the two of these on the West Coast were visited and the general problems of the telescope discussed with them: Boller & Chivens in Pasadena (recently affiliated with Perkin-Elmer, increasing considerably their corporate strength and versatility); and Westinghouse, Sunnyvale, California (several large optical and radio telescope projects now underway).

C. Personnel Connected with the Contract

During this quarter, the full or part-time employees under the contract included Benny Edwards (layout and drafting), James McCullough (computing), Henry G. Rylander (bearing engineering), Jack Sedwick (layout and drafting), Charles Seeger (engineering and electronics), Charles Thompson (engineering and drafting), and Peggy Smith (secretary).

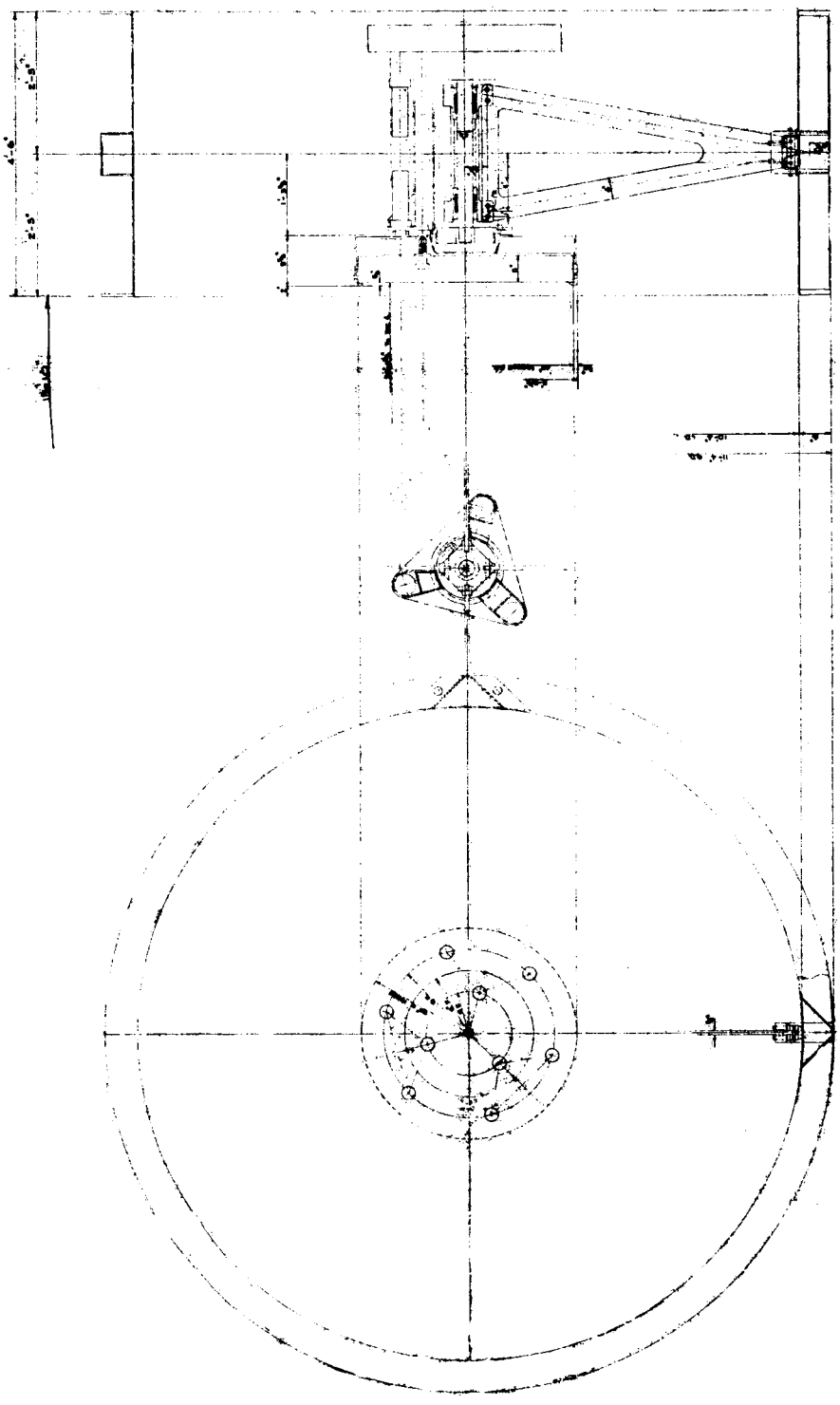
D. Financial Report

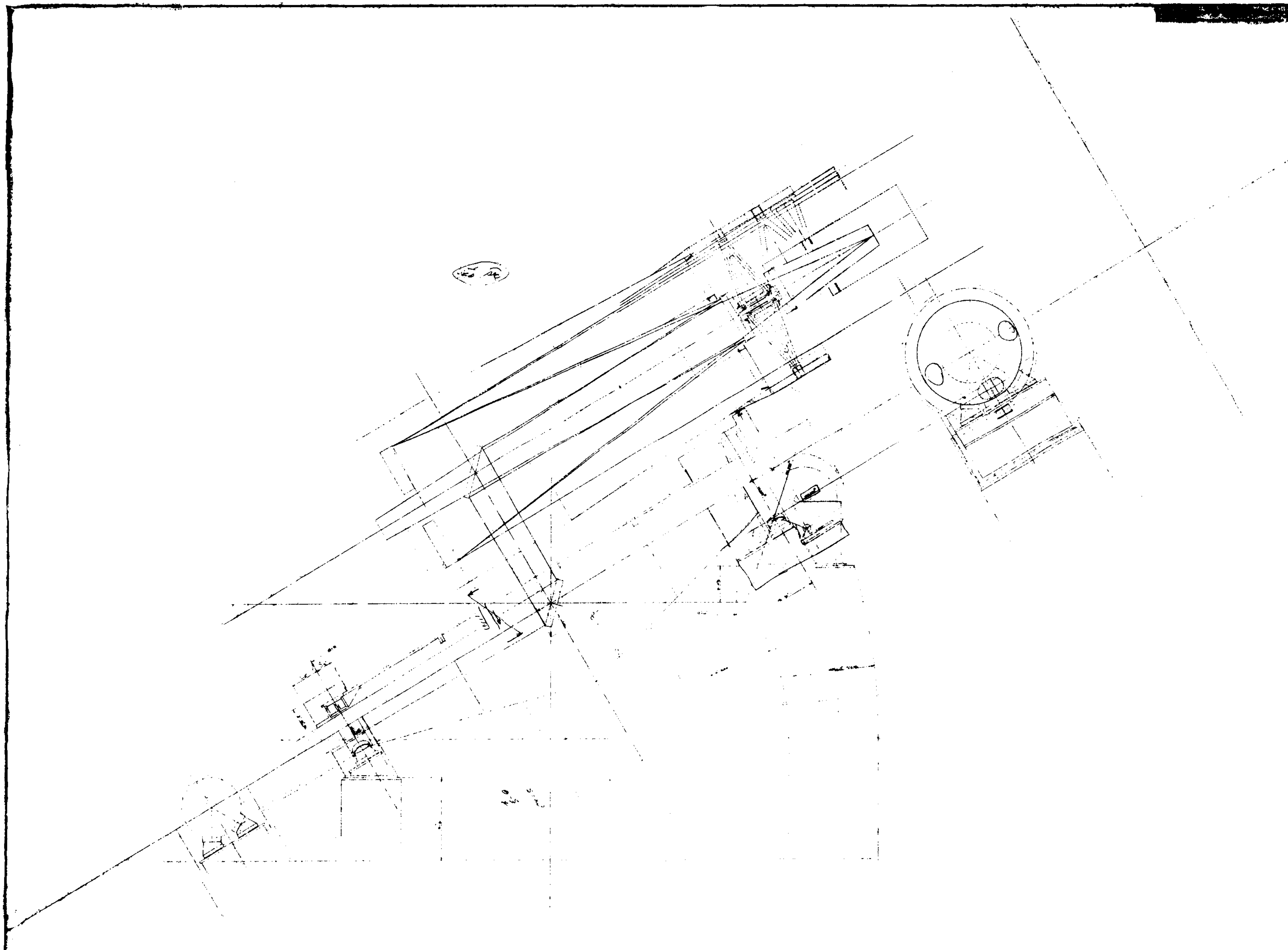
NASA Form 1030 (2-64) for this contract is submitted quarterly by the Auditor's Office of The University of Texas.

F. Illustrative Appendices

Several additional samples of the design drawings and sketches indicating progress of the work are appended:

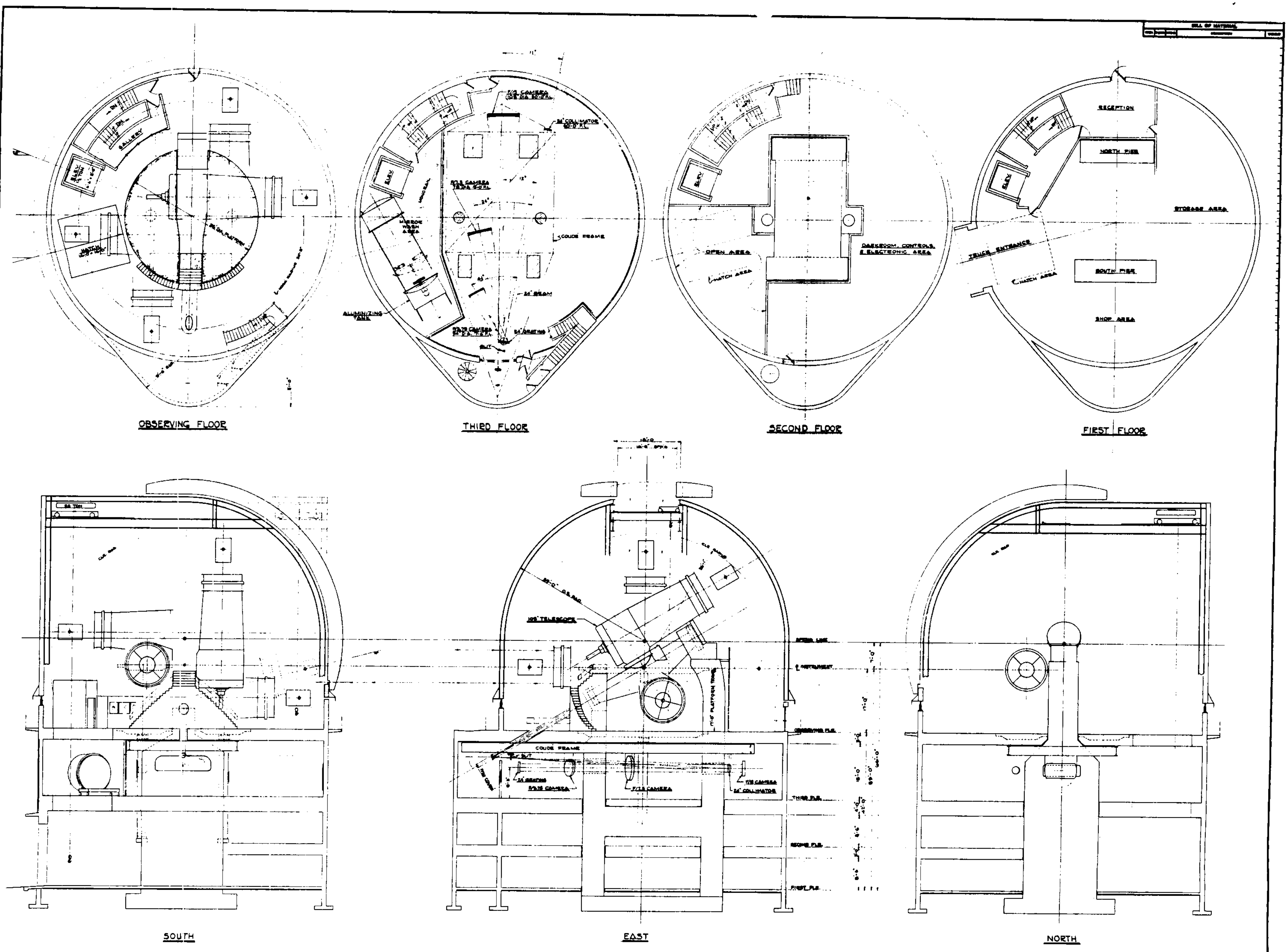
1. Print 660E30 - Secondary Assembly, F/10 Cass & F/30 Coude
2. Print 660E31 - Telescope General Assembly, showing prime-focus cage
3. Print 660E32 - Stellar Observatory - 78-foot Dome
4. Print 26004 - 78-foot Dome, Observing Floor
5. Print 26003 - 78-foot Dome, Third Floor
6. Print 26002 - 78-foot Dome, Second Floor
7. Print 26001 - 78-foot Dome, First Floor





JONES

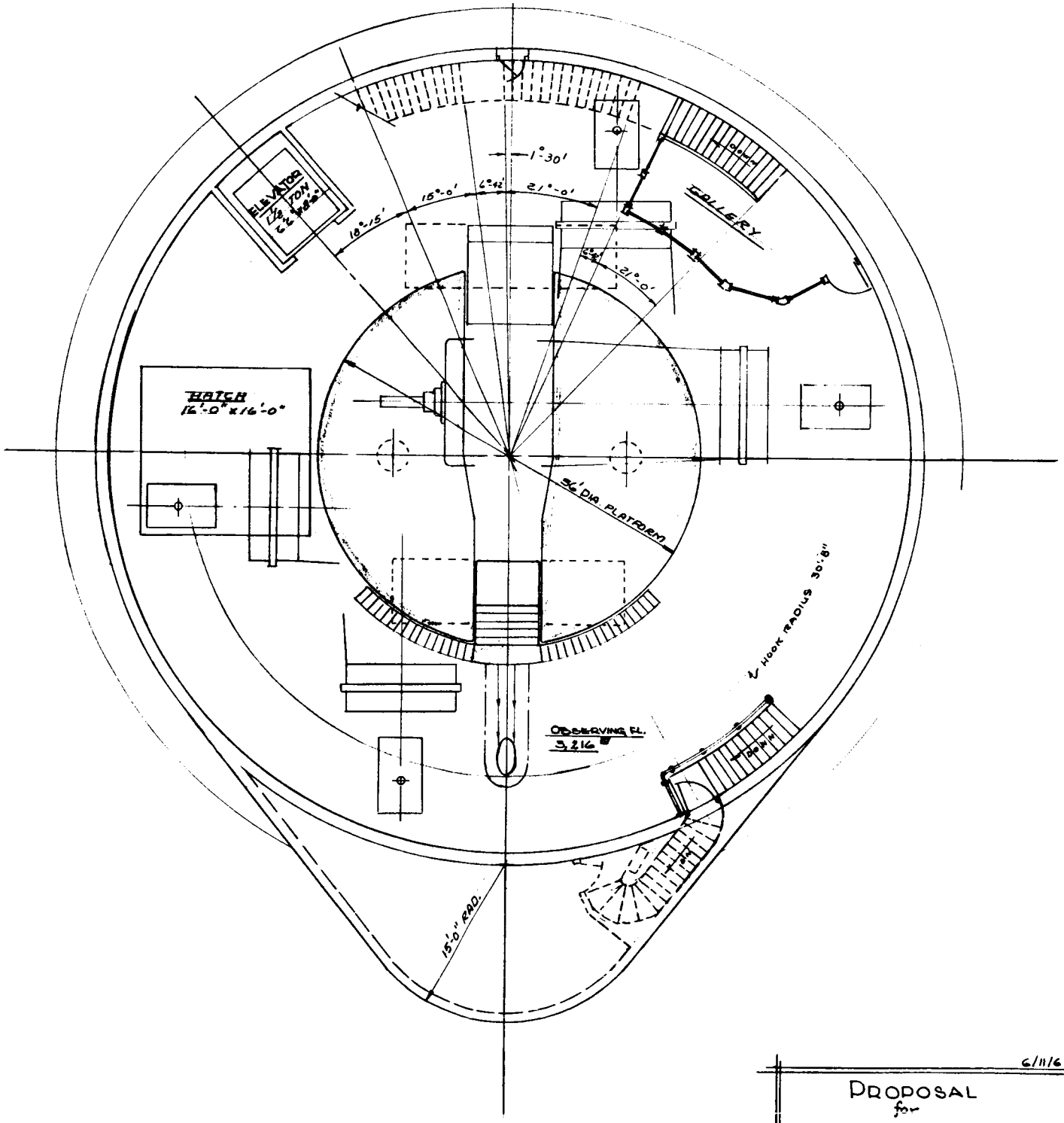
66OE 31



STELLAR OBSERVATORY - UNIV. OF TEXAS
78 FT. DOME

CHARLES W. JONES
ENGINEERING
LOS ANGELES CALIFORNIA

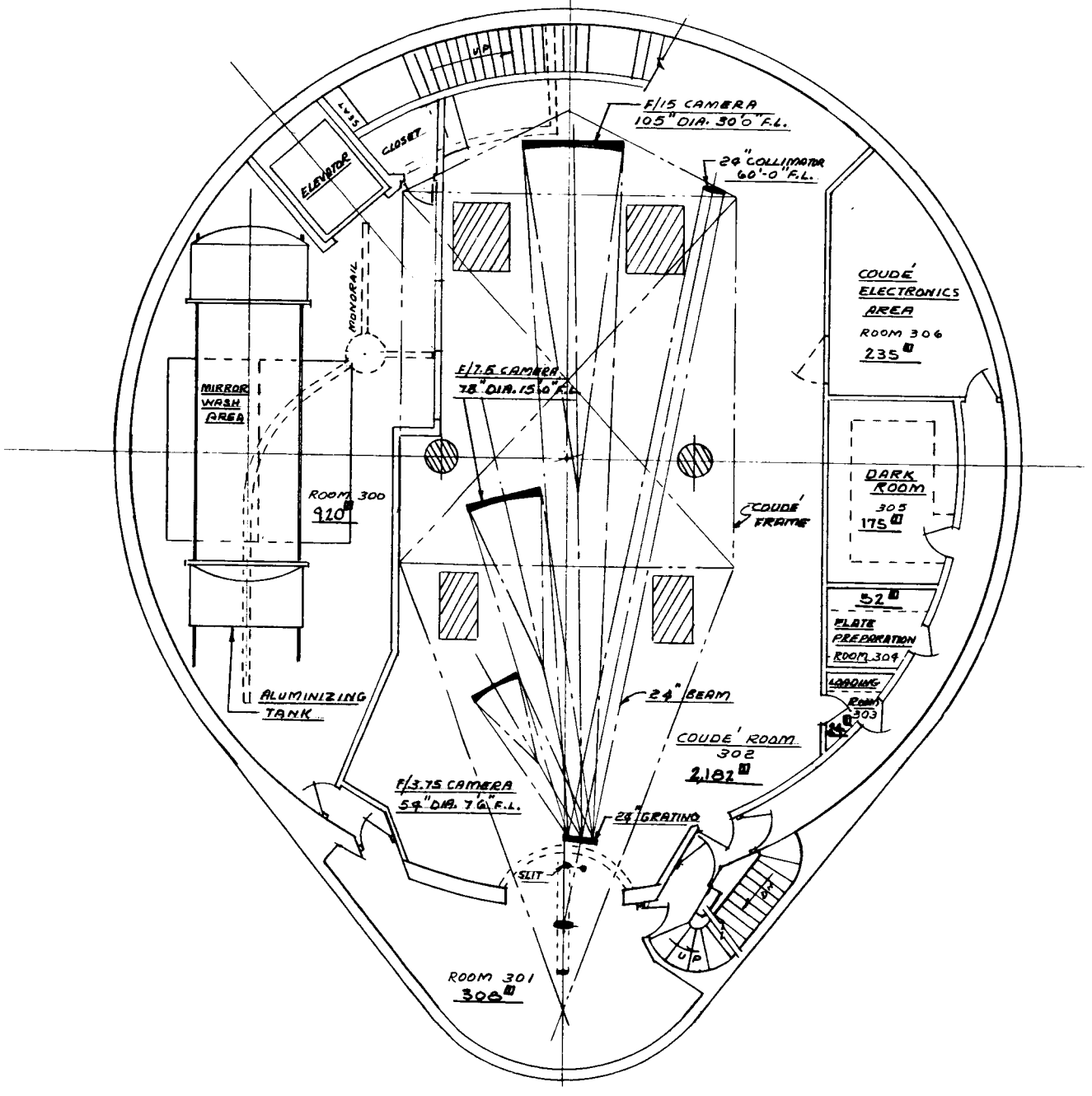
660 E 32



OBSERVING FLOOR

6/11/65

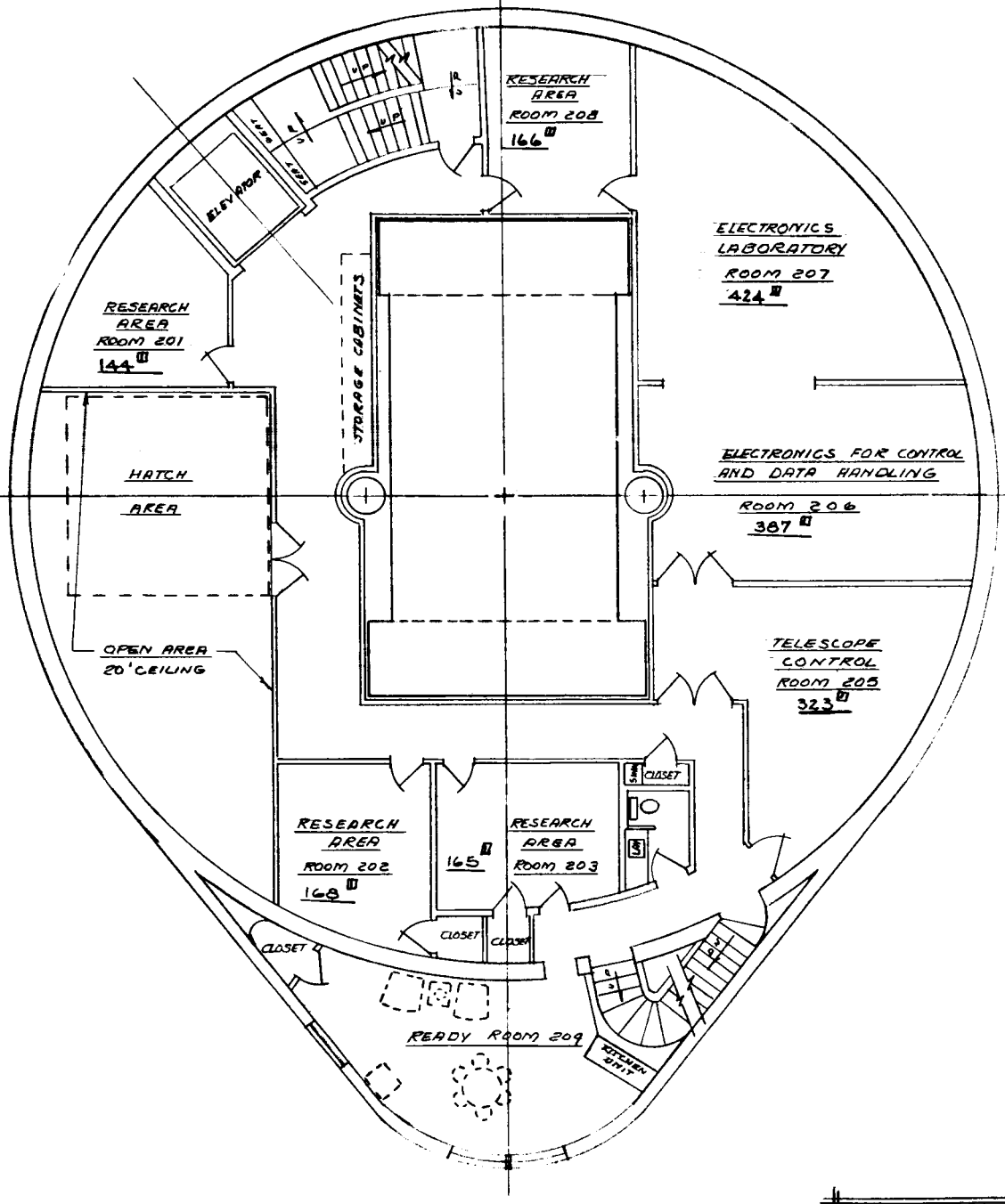
PROPOSAL
for
STELLAR OBSERVATORY
UNIV. OF TEXAS
McDONALD OBSERVATORY
78 FT. DOME | 26004



THIRD FLOOR

6/11/65

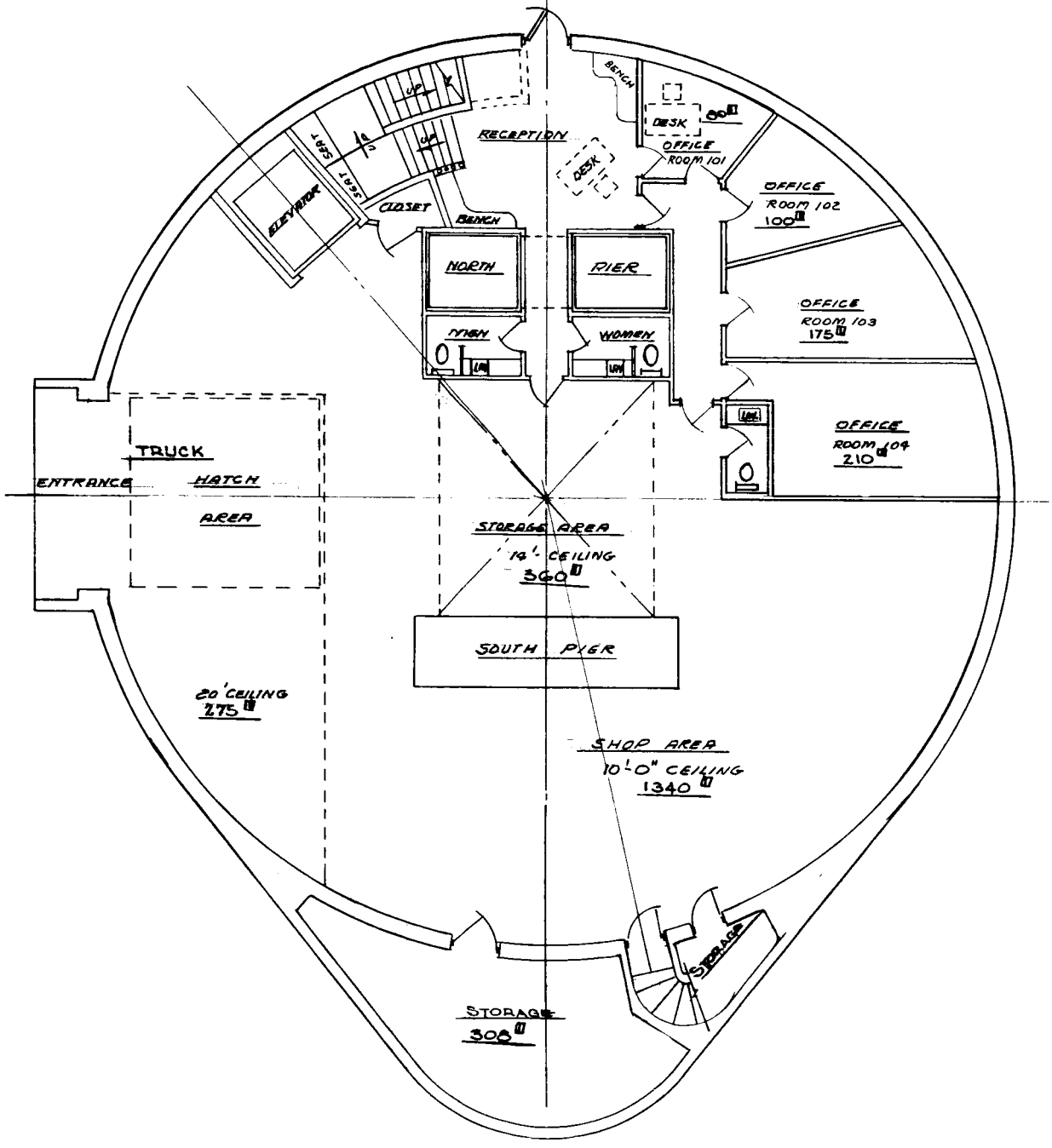
PROPOSAL
for
STELLAR OBSERVATOR
UNIV. OF TEXAS
MC DONALD OBSERVATORY
78 FT. DOME | 26003



SECOND FLOOR

6/11/68

PROPOSAL
for
STELLAR OBSERVATORY
UNIV. OF TEXAS
McDONALD OBSERVATORY
78 FT. DOME | 26002



FIRST FLOOR

SCALE: 1/8" = 1'-0"

6/11/65

PROPOSAL
for
STELLAR OBSERVATORY
UNIV. OF TEXAS
MC DONALD OBSERVATORY
78 FT. DOME | 26001